

# Summary of Activities for 6/1/1993 through 5/31/94

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N00014-93-1-0871

During the past year, we continued our efforts in the areas of video compression and storage [1, 2].

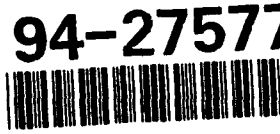
We have developed three strategies for placement of Constant Bit Rate (CBR) video data on parallel disk arrays. Using a low-level disk model and video data from a scalable subband coding technique, we have derived constraints with which to compare the three strategies. In doing so, we have found one of the strategies, constant frame grouping, to be superior to the other two. In addition, two methods for interleaving multiple videos under the constant frame grouping strategy have been developed: nonperiodic and periodic. Periodic interleaving is shown to have the advantages of a lower access time and limited scan and pause functions. The constant frame grouping strategy was tested on an actual array of 8 disks and shown to have performance that is close to the theoretical prediction. The scalable nature of the compressed data was used to relieve the disk system overload for an overly high request rate. Details of this work was presented at the SPIE Symposium on Electronic Imaging in San Jose last February [1].



We have also extended the above work to Variable Bit Rate (VBR) data placement on disk arrays. In this case, we store data blocks corresponding to constant real-time playback duration. Because of the VBR characteristics and the constant bandwidth read channel, disk overload occurs at peak usage periods. Our strategy to deal with disk overload is to temporarily stop service to low-priority users. To do so, we propose a number of classes of service corresponding to various probabilities of loss, during which time service is suspended. Thus, a major problem is estimating probability of loss or suspension so that a video server system can guarantee service with actual loss probabilities that do not exceed the specified thresholds at the call setup time. We have proposed three techniques for computing loss probabilities: histogram convolution, Central Limit Theorem, and Cramer's rule. We have







developed an efficient placement strategy and an optimal admissions control strategy that guarantees loss probability thresholds while maximizing the number of requests that can be satisfied at all qualities. We have extended these ideas to encompass scalability by allowing appropriate frames in the MPEG-encoded data to be dropped without fully suspending service to any one user. This allows the system to make intelligent choices in gracefully degrading the request data rates during periods of peak usage. Finally, we have tested the data placement and admissions control algorithms with a discrete event disk array system simulator and shown that the results are in accordance with theoretical predictions. Details of our work in this area will be presented at the Community Networking Workshop in San Francisco this July [2].

# References


[1] E. Chang and A. Zakhor, "Scalable Video Data Placement" to be presented at the SPIE Electronic Imaging Symposium, San Jose, CA, Feb. 1994.

[2] E. Chang and A. Zakhor, "Variable Bit Rate MPEG Video Storage on Parallel Disk Arrays," To be presented in the Community Networking Workshop, July 1994, San Francisco.